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NEMATODE ENTRY AND DISPERSION BY WATER IN FLORIDA NURSERIES

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Introduction: Agricultural product specialists working in Florida nurseries are occasionally confronted with outbreaks of nematode pests involved in regulatory programs. In order to evaluate such outbreaks for regulatory purposes the specialist should have knowledge of how nematodes enter nurseries.

Nematodes are water-dependent for survival and dispersion. The activities of some species of foliar (Aphelenchoides spp.) and awl (Dolichodorus spp.) nematodes are stimulated by an overabundance of water. Below 7-8% soil moisture, nematode activity ceases, and when soil particles lose their water film, most nematodes in the desiccated environment die.

Following are means by which nematodes enter and disperse in nurseries via water, and measures to inhibit such dispersion.

Rainfall and Flooding: During heavy rainfall, nematodes may infect plants in containers from soil particles splattered by rain. Foliar nematodes are more active during rain or heavy mists. Ground flooding following a heavy rain (fig. 1) can also spread nematodes into uninfested nursery areas. Preventive Measures: Provide good drainage on the nursery site to keep flooding to a minimum. Fill low areas with uninfested soil where water consistently stands. Keep container stock out of ground contact when possible.

Runoff and Subsoil Drainage: Nurseries situated on or at the bottom of a slope might become nematode-infested by runoff from higher ground, or by subsoil water. For example, burrowing nematodes (Radopholus similis) situated on a slope were found to move 7.6 meters uphill and 70 meters downhill in a year's time. Preventive Measure: When feasible, do not locate new nursery sites at the bottom of a slope.

Natural Bodies of Water: Serious plant-destructive nematodes such as awl nematodes are naturally established in or on the shoreline of lakes, ponds, and waterways where they feed on aquatic plants and grasses growing in or on the edge of the water. These forms float free in the water at various times in their life cycle and can be pumped into a nursery operation when such a nematode-infested body of water is used for nursery irrigation.

An example of this occurred in a pine seedling nursery in North Florida, when awl nematodes were found in pine seedling soil and in the lake that served as a source of irrigation water. Some pine seedling beds were partially destroyed by the awl nematode. A second example concerned a turf nursery located in a low site adjacent to a large water-covered area that was also found heavily infested with awl nematode. Preventive Measures: Do not use lakes or ponds (fig. 2) as a source of water unless absolutely necessary. If lakes or ponds must serve as a source of irrigation water, a check should be made for the presence of aquatic plant-parasitic nematodes. If aquatic plant-destructive nematodes such as awl nematodes are found, an alternate source of irrigation should be considered.

Irrigation Water: Irrigation water used on more than one field or drawn off one field to irrigate another can introduce nematodes to new areas.

Standing Water: Low areas in the nursery where pools of water accumulate during heavy rainfall (fig 3), or surface water resulting from excessive irrigation, constitute migratory waterways and sources of contamination by which nematodes arrive at new plantings. Such areas have been seen in some of the largest and most efficient nursery operations in Florida.

Hand Watering: Watering with a high pressure stream splashes soil particles and nematodes onto uninfested plants. Dragging hoses and other equipment across beds during watering or leaving hoses on the ground after watering are common practices in many nurseries. Such practices spread nematodes about an area (fig. 4). Preventive Measures: Avoid high pressure water streams that cause excessive splashing of soil particles. Controlled irrigation with water metering devices to individual containers is the best possible watering practice. Do not drag water hoses across ground-beds. Secure hoses off the ground after watering.

Plants Under Plants: Unprotected plants under or on benches where plants are placed under other plants or suspended in hanging containers may become infected with nematodes or fungus spores carried in water dripping from infected plants above (fig. 5). Preventive Measures: Avoid placing plants under other plants. When this must be done, use polyethylene sheets or asphalt paper to protect the lower plants from drippings that may contain plant pests.

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Container Surface Drainage: Surfaces upon which plants in containers are placed can lead to extensive nematode infection if drainage is poor. One example of this included clean bird-of-paradise (Strelitzia reginae Ait.) plants grown in nematode-free soil in 20 cm clay pots. The plants were placed on a bench with a flat wood surface adjacent to nematode-contaminated plants. Bench drainage was very poor and after a heavy watering, pots stood for several days in about 3 mm of water. Examination of the plants after about a year under these conditions revealed a very large population of spiral nematodes in the previously uninfested plants. Preventive Measures: Provide good drainage from any surface upon which plant containers rest (fig. 6).

Survey and Detection: When searching for possible causes of nematode contamination within a nursery one should consider sites near the contaminated area where an overabundance of water is present, or poor sanitation practices in hand watering or irrigation are evident. Samples should be taken from plants on the borders of such sites, and the condition of the site should be included in the data.

Fig. 1. Flood waters in a cyst-infested soybean field.

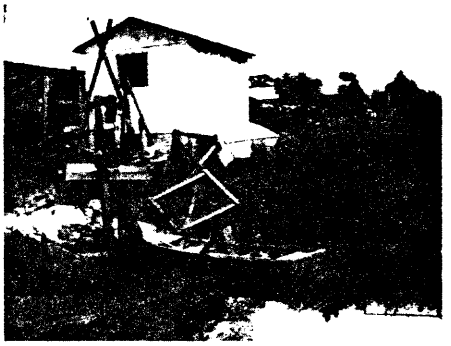

Fig. 2. Pond used for nursery irrigation.

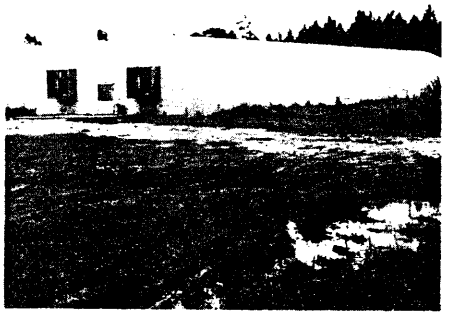

Fig. 3. Soil and water from flooded areas in front of greenhouses were carried into houses on shoes.

Fig. 4. Hose left on soil after use.

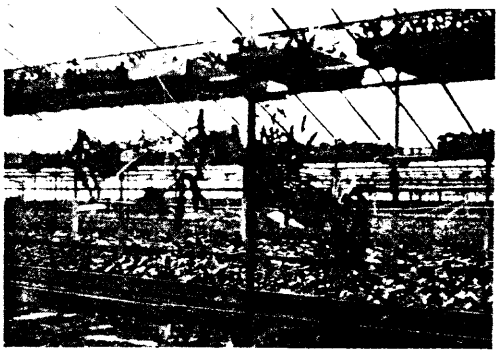

Fig. 5. Plants under plants.

Fig. 6. Excellent container drainage.

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